CLAIMS

What is claimed is:

1. A method comprising:

depositing a seed layer of a metal over a surface of a substrate;

depositing a layer of a sacrificial material over the seed layer;

forming a number of trenches in the sacrificial layer, wherein the seed layer is exposed in each of the trenches;

depositing a layer of the metal over the exposed seed layer in the trenches, the metal layer extending over portions of an upper surface of the sacrificial layer, wherein gaps remain between the metal material extending from adjacent trenches and over the upper surface of the sacrificial layer;

removing the sacrificial layer, wherein regions from which the sacrificial layer has been removed form channels in the metal layer; and

depositing an additional layer of the metal over upper surfaces of the metal layer to close the gaps over the channels.

2. The method of claim 1, further comprising reflowing the metal to seal each of the channels.

3. The method of claim 2, further comprising depositing a thermal interface material over the metal material.

4. The method of claim 2, wherein the reflowing of the metal is performed at a temperature between 200 °C and 400 °C.

5. The method of claim 2, further comprising establishing fluidic connections with at least some of the channels.

6. The method of claim 5, wherein establishing the fluidic connections comprises:

providing an inlet fluid reservoir in fluid communication with at least some of the channels; and

providing an outlet fluid reservoir in fluid communication with at least some of the channels.

7. The method of claim 1, wherein the channels have a depth of between 10 μm and 500 μm.

8. The method of claim 7, wherein the channels have a depth of approximately 50 μm.

9. The method of claim 7, wherein the channels each have a width of between 5 μm and 50 μm.

10. The method of claim 1, wherein the metal comprises copper.

11. The method of claim 1, wherein the metal layer is selectively deposited on the seed layer by one of an electroplating process and an electroless plating process.

12. The method of claim 1, wherein the sacrificial material comprises one of a dielectric material and a photoresist material.

13. The method of claim 1, wherein the sacrificial material is removed by one of a chemical etch process and a thermal decomposition process.

14. The method of claim 1, wherein the substrate comprises an integrated circuit die.

15. The method of claim 1, wherein the substrate comprises a wafer.

16. The method of claim 1, wherein the substrate comprises a heat spreader for an integrated circuit die.

17. A method comprising:
forming a number of channels over a surface of an integrated circuit die;
forming a barrier on the die surface, the barrier extending about a periphery of the die and defining an interior region including the channels;
forming an inlet reservoir within the interior region of the barrier, the inlet reservoir in fluid communication with at least some of the channels; and
forming an outlet reservoir within the interior region of the barrier, the outlet reservoir in fluid communication with at least some of the channels.

18. The method of claim 17, further comprising coupling a cover plate with the die, the cover plate extending over the barrier and the interior region, the cover plate including a first aperture in fluid communication with the inlet reservoir and a second aperture in fluid communication with the outlet reservoir.

19. The method of claim 18, wherein the cover plate comprises a heat spreader.

20. The method of claim 18, further comprising:
making a first fluidic connection with the first aperture and the inlet reservoir; and
making a second fluid connection with the second aperture and the outlet reservoir.

21. The method of claim 17, wherein forming the number of channels comprises:

depositing a seed layer of a metal over the die surface;

depositing a layer of a sacrificial material over the seed layer;

forming a number of trenches in the sacrificial layer, wherein the seed layer is exposed in each of the trenches;

depositing a layer of the metal over the exposed seed layer in the trenches, the metal layer extending over portions of an upper surface of the sacrificial layer, wherein gaps remain between the metal material extending from adjacent trenches and over the upper surface of the sacrificial layer;

removing the sacrificial layer, wherein regions from which the sacrificial layer has been removed form the channels in the metal layer; and

depositing an additional layer of the metal over upper surfaces of the metal layer to close the gaps over the channels.

22. The method of claim 21, further comprising reflowing the metal to seal each of the channels.

23. The method of claim 22, further comprising depositing a thermal interface material over the metal material.

24. The method of claim 21, wherein the metal comprises copper.

25. The method of claim 24, wherein the barrier is formed from a material comprising copper.

26. A device comprising:

an integrated circuit die; and

a cooling system coupled with the die, the cooling system comprising

a number of channels disposed over a surface of the die,

a barrier disposed on the die surface, the barrier extending about a periphery of the die and defining an interior region including the channels,

an inlet reservoir within the interior region of the barrier, the inlet reservoir in fluid communication with at least some of the channels, and

an outlet reservoir within the interior region of the barrier, the outlet reservoir in fluid communication with at least some of the channels.

27. The device of claim 26, further comprising a cover plate coupled with the die, the cover plate extending over the barrier and the interior region, the cover plate including a first aperture in fluid communication with the inlet reservoir and a second aperture in fluid communication with the outlet reservoir.

28. The device of claim 27, further comprising:
a first fluidic connection coupled with the first aperture and the inlet reservoir; and
a second fluidic connection coupled with the second aperture and the outlet reservoir.

29. The device of claim 26, wherein the channels are formed from a material comprising copper.

30. A system comprising:
a memory; and
a processing device coupled with the memory, the processing device including an integrated circuit die and a cooling system coupled with the die, the cooling system comprising
a number of channels disposed over a surface of the die,
a barrier disposed on the die surface, the barrier extending about a periphery of the die and defining an interior region including the channels,
an inlet reservoir within the interior region of the barrier, the inlet reservoir in fluid communication with at least some of the channels, and
an outlet reservoir within the interior region of the barrier, the outlet reservoir in fluid communication with at least some of the channels.

31. The system of claim 30, further comprising:

a cover plate coupled with the die, the cover plate extending over the barrier and the interior region, the cover plate including a first aperture in fluid communication with the inlet reservoir and a second aperture in fluid communication with the outlet reservoir;

a first fluidic connection coupled with the first aperture and the inlet reservoir; and

a second fluidic connection coupled with the second aperture and the outlet reservoir.

32. The system of claim 30, wherein the channels are formed from a material comprising copper.